INTERMOUNTAIN STATION
Central Reference File
No. 0.73 X 2.271
X 3.22

RESEARCH NOTE

Northern Rocky Mountain
Forest & Range Experiment Station
Missoula, Montana

No. 1. January 1940

SUCCESSFUL FORESTATION BY DIRECT SEEDING USING POISONS FOR RODENT CONTROL

By

C. S. Schopmeyer

A major problem in forestation by direct seeding is the elimination of seed-eating rodents from the seeded areas. In the past, many repellents and poisons have been tried in attempts to minimize rodent depredations but none was satisfactory. Recently, the Control Methods Research Laboratory of the Biological Survey developed a poisoning method for the control of mice and chipmunks on seeded areas which shows promise of being efficient. The method consists of prepoisoning the selected area about 1 week before sowing with hulled sunflower seed treated with thallium sulfate (1 part of Tl_2SO_4 to 100 parts of seed by weight). A pinch of this bait is spread at intervals of 15 feet on the surface of the ground. The size of the pinches are regulated to obtain a distribution of one pound of bait per acre. In addition to this prepoisoning treatment, the seed to be sown is coated with a poisonous mixture containing approximately 48 percent yellow dextrine, 34 percent plaster of paris, 15 percent cornmeal, and 3 percent strychnine alkaloid. The coating increases the weight of the seed 2.4 times. This method was tested in the direct-seeding studies reported here.

Two areas in the western white pine type were selected in the fall of 1938 for sowing with these poisoning treatments. A greater number of the areas sown in the same season would be

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desirable from the statistical angles of replication and randomization but since any one test area must necessarily be large in size it was impracticable to sow more than two areas. If tests are made over small areas of 5 acres or less, for example, rodents, although poisoned as they come, might move in continuously until most of the seed is cleaned out. The minimum size of an adequate test area depends on the size of the rodent population. Since this factor was not quantitatively determined, the size of the larger of the two areas was arbitrarily set at 50 acres. A smaller area of 11 acres was also selected to determine whether or not the poisons would be effective on an area of that size. The larger area is located in the Kalispell Creek Drainage of the Kaniksu National Forest (Pend Oreille County, Washington). The smaller one is in the Deception Creek Experimental Forest (Kootenai County, Idaho). Both areas were clear-cut in 1937 and broadcast burned about 1 month before sowing. The Kalispell Creek area is on a flat bench having sandy loam soil which is slightly podsolized. The complete barrenness of this site after burning is shown in figure 1 which is a general view, and in figure 2 giving a close-up view of a soil surface typical of such areas. The foreground of figure 1 shows an area burned in the fall of 1937, planted in the spring of 1938, and covered with brush and herbaceous vegetation at the time the photograph was taken in the spring of 1939. The Deception Creek area is on a north-facing slope with silt loam soil and is completely surrounded by green timber.

Although a quantitative estimate of the rodent population on the two areas could not be made, qualitative evidence of the presence of rodents was obtained. On the Kalispell Creek area, before spreading the poisoned bait, five chipmunks and 21 white-footed mice were caught over a period of 4 days in a trap line of 24 mouse traps which were baited and set daily. The trap line was set out 3 weeks after the area was burned. No trap lines were run on the Deception Creek area, but data obtained the year previous on a nearby site indicated the presence of rodents on the area.

Poison-coated seed of western white pine was sown in spots spaced 8 feet apart with approximately 20 seeds per spot on both areas. Sowing crews of CCC men were equipped with hazel hoes for scraping away ashes and duff encountered in the preparation of spots. Each crew member carried his poison-coated seed in a size 2½ tin can fitted with a spring-hinged lid and with a metal belt loop. A can of this size will hold 1 pound or approximately 10,000 poison-coated western white pine seeds, a quantity more than sufficient for a day's work. Crews were instructed to cover the seeds with 3/8 inch of mineral soil. Many spots were found, however, with a covering greater than the specified depth.

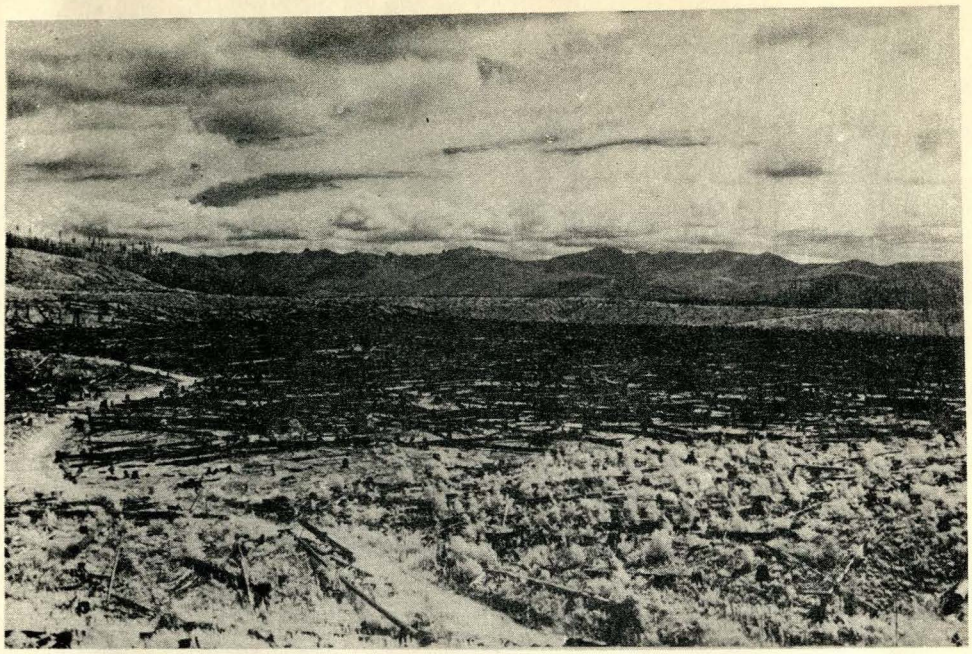

FIGURE 1. SITE OF SEEDED AREA ON FRESH BROADCAST BURN, KALISPELL CREEK, KANIKSU NATIONAL FOREST, WASHINGTON. ONE-YEAR-OLD BURN IN FOREGROUND.

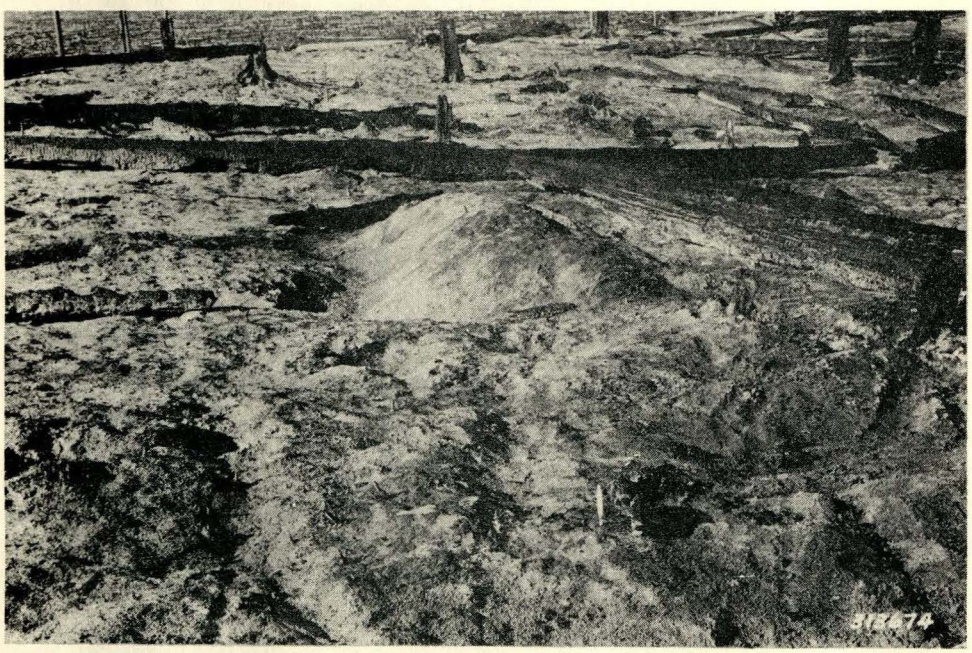

FIGURE 2. CLOSE UP VIEW OF SOIL SURFACE ON A BROADCAST BURNED AREA.

Germination was satisfactory on both areas in spite of the presence of rodents previous to sowing. Seedling counts were made on sample plots of 25 spots each distributed systematically over the areas. On the Kalispell Creek area 12 plots were examined and on the Deception Creek area 9 plots were used. The results of these counts, in table 1, show that germination of one or more seeds occurred in 76 percent of the spots on the Kalispell Creek area. On the Deception Creek area, 93 percent of the spots had one or more germinated seeds.

Table 1.--Germination and survival on seeded areas

Location of seeded area	Area	Spots examined	Germination		First-year survival	
			Stocked spots 1/	Seedlings per stocked spot	Stocked spots 1/	Seedlings per stocked spot
	Acre	Number	Percent	Average Number	Percent	Average Number
Kalispell Creek	50	300	76	3.5	69	3.1
Deception Creek	11	225	93	4.8	85	4.2

1/ Number of spots with one or more seedlings expressed as a percentage of total number of spots sown.

Several factors may have contributed to the greater germination on the Deception Creek area. Since the seeded area was located on a north-facing slope, available soil moisture may have been greater than on the sandy flats of the Kalispell Creek drainage. Seed-eating rodents may have been more numerous on the Kalispell Creek area requiring more poison-coated seed to kill them off. A more careful job of sowing may have been done on the Deception Creek area as different crews and different foremen were used on each area. The most pronounced effect of careful sowing is manifested in depth of covering. On the Kalispell Creek area, expert sowing at a depth of 3/8 inch ± 1/16 inch resulted in germination in 11 percent more spots than did CCC crew sowing which varied from 1/4 to 1 inch. This comparison was not made, however, on the Deception Creek area, hence the relative efficiency of the two crews cannot be definitely evaluated.

Survival on the seeded areas was satisfactory although precipitation was considerably less than normal during the 1939 growing season in northeastern Washington and northern Idaho. On the Kalispell Creek area, 69 percent of the spots had one or more seedlings at the end of the first growing season as shown in table 1. On the Deception Creek area, stocking at the end of the first growing season was 85 percent. Decreases in percentages of stocked spots during the first growing season were approximately the same for both areas, being 7 percent for the Kalispell Creek area and 8 percent for the Deception Creek area. Decrease in number of seedlings per spot was 12 percent of the total number of germinated seeds on both areas. Apparently the differences in site factors and sowing crews caused no appreciable differences in total mortality on these two areas.

The relative efficiency of seeding as compared to planting with respect to number of trees established is important in deciding whether a given area should be seeded or planted. On a plantation of 2-2 stock of western white pine with trees 8 feet apart planted in the spring of 1939 on a broadcast burned area adjacent to the Kalispell Creek seeded area, first-year survival was 68 percent. Hence, in this case at least, stocking resulting from seeding is equally as good as that resulting from planting.

Cost records kept on the 50-acre area show that seeding by this method is more economical than planting. An itemized list of costs on this area is in table 2.

Table 2.--Seeding costs on a 50-acre area

Item	Cost per acre
Technical supervision and traversing	$ 0.51
Bait and labor for prepoisoning	0.47
Seed at $3.10 per pound	2.48
Materials and labor for seed coating	0.80
Labor for sowing (2 CCC man-days per acre at $1.50 per man-day, plus foreman time, and transportation)	3.57
Total	$ 7.83

The average cost of planting in the Northern Rocky Mountain region for the year 1938 was $13.13 per acre.

This figure, however, includes an item for regional office and national forest overhead amounting to approximately $1.50 per acre. Although this item did not apply to the experimental seeding operations, it must be added to the seeding cost to make it comparable to the planting cost. A comparison of the corrected seeding cost of $9.33 per acre with the average planting cost shows that this seeding was done for 71 percent of the average cost of planting.

These tests indicate that direct seeding, using the described poisons for rodent control, is both practical and economical. It should be emphasized, however, that the tests were made on broadcast burned areas where no competing vegetation existed during the first growing season after burning. Additional tests of the method on older burns where brush competition is a factor and on more severe aspects are needed to show to what extent the method can be used successfully.

The necessity of using both the prepoisoning treatment and the poison coating on seeds has not yet been established. It may be possible to secure equally good results without one of the two poisoning treatments. Plots were established in the fall of 1939 from which information on this point will be obtained.